

Secondary Containment Analysis and Consultation for the Underground Field Constructed Tanks at the Red Hill Underground Fuel Storage Facility

I. Background

The Red Hill Underground Fuel Storage Facility (Facility) is an underground complex of 20 very large field constructed underground storage tanks (USTs), four large USTs and associated piping located near Pearl Harbor on the island of Oahu in Hawaii. The Facility is owned and operated by the U.S. Navy and was constructed from 1940 – 1943. The facility is located 2.5 miles west of Pearl Harbor. The USTs were constructed by tunneling into the volcanic mountain and constructing the tanks inside the mountain. This link provides a short history of the construction of the Facility: <https://www.youtube.com/watch?v=llz8IstwnWU>

Each of the 20 tanks at the Facility is approximately 250 feet high and 100 feet in diameter. The storage capacity of each tank is about 12.5 million gallons, for a total Facility capacity of about 250 million gallons. The tanks are constructed of ¼ inch thick steel plates, welded together, and backed by a layer of concrete and rebar and the volcanic rock of the mountain. Each tank is connected to a pipeline which runs through an underground tunnel from the Facility to a fueling pier at Pearl Harbor. The tanks are oriented in two rows of ten tanks, numbered 1 -20, with tanks 1 and 2 being the western most tanks (closest to Pearl Harbor) and tanks 19 and 20 being the farthest east tanks (located furthest from Pearl Harbor).

Over its 70 year life, the Facility has stored a number of different types of fuel, including bunker fuel, aviation gasoline, motor gasoline, marine diesel, and jet fuel. Currently the Facility stores marine diesel fuel, Jet Propulsion Fuel Number 5 (JP-5) and Jet Propulsion Fuel Number 8 (JP-8). Based on anecdotal information the Facility has experienced fuel releases in varying amounts from a number of tanks. These suspected releases have occurred since the Facility became operational in 1943.

The Facility is adjacent to and above two drinking water aquifers that together supply approximately 25% of the drinking water for the residents of Oahu, HI. In January 2014, the U.S. Navy reported that an estimated release of 27,000 gallons of JP-8 from Tank #5. Tank #5 had been recently inspected and refurbished and was being re-filled when the release was discovered. Upon discovery, the U.S. Navy emptied Tank #5 and re-inspected the tank interior in order to ascertain from where the fuel leaked. 17 suspected release points were discovered during the re-inspection. At this time, the U.S. Navy and the U.S. EPA are engaged in negotiations to evaluate the existing leak detection systems for the field-constructed USTs and to determine the extent, feasibility and potential performance capabilities of implementing improvements to these existing systems.

II. Scope / General Requirements

The tanks at the Red Hill Facility were constructed in the early 1940s as single walled steel tanks with concrete grout pumped in the void space between the tank and the surrounding natural rock (see video link above). The Navy has investigated the possibility of secondary containment in the past but has not taken steps to implement such release prevention methods, instead relying on

a schedule of inspection and repair for each tank to correct any deficiencies identified. The Contractor shall review any previous secondary containment studies conducted by the Navy and provide EPA with a report evaluating the Navy's efforts. The Contractor shall also provide a report which identifies current secondary containment technologies and the feasibility of implementing such technologies at the Red Hill Facility. The Contractor shall provide a report to EPA which evaluates secondary containment technologies that provide interstitial space for monitoring leaks from the inner shell of the tanks as well as other tank lining technologies that do not provide interstitial spaces for monitoring.

III. Assumptions

Due to the structure, size, location, confined space and age of the field-constructed USTs at the Facility, determining the feasibility and preferred application of secondary containment structures to prevent the likelihood of future releases is exceptionally challenging. This contract requires specialized expertise in the following areas:

- 1) Secondary containment systems for large USTs with volumes over 500,000 gallons of petroleum
- 2) Industry best practices for secondary containment in large field-constructed USTs
- 3) Structural engineering of large steel vessels and concrete containment structures
- 4) Containment vessel liners and coatings and their material properties and characteristics
- 5) Extensive knowledge of American Petroleum Institute (API) Standards including, at a minimum, API 653 and 650

The contractor will be required to assist EPA in evaluating the feasibility of installing secondary containment for the field-constructed USTs at the Facility. The contractor shall have working knowledge of current industry practices for secondary containment for large field-constructed tanks and be able to analyze the likelihood of novel technological proposals for secondary containment. The contractor shall have experience installing, managing the installation, or being a member of a team which installed secondary containment at a large field-constructed UST.

The contractor shall have knowledge of the structural engineering principles associated with large steel and concrete containment structures and vessels. In particular, the contractor shall have knowledge of large concrete containment structures lined with carbon steel. The contractor shall have knowledge to determine the integrity of these structures and methodologies to determine the potential for releases from them.

The contractor shall have knowledge and experience installing liners or coatings on petroleum containment vessels. The contractor shall have knowledge regarding the material properties of vessel coatings and liners in various physical settings. The contractor shall have ability to determine the costs of installing the various liners or coatings on the large-field constructed USTs at the Facility.

The contractor shall be certified in, or have extensive knowledge of, at least one or more API standards for large containment vessels. The contractor shall be familiar with how API standards will effect implementation of secondary containment structures.

IV. Specific Task Description(s)

1. Project Management-

The Contractor shall identify the individuals and/or principles assigned to this contract. The resumes or curriculum vitae shall be included for each individual. After the Contractor has assigned the appropriate personnel to the contract, EPA and the Contractor shall have an initial meeting to discuss the scope of the work assigned and a subsequent planning meeting. The Contractor shall have at least monthly conference calls with EPA to discuss the Contractor. These monthly conference calls may be waived by EPA staff, depending on the status of work being performed for the tasks described below.

2. Previous Navy Evaluation

In response to the January 2014 release and at the request of the regulatory agencies, the Navy has transmitted and continues to transmit historical documents and additional information pertaining to the underground fuel storage systems. These documents include previous investigations to implement secondary containment at the Facility and the application of various coatings to improve the integrity of the large field-constructed tanks. The Contractor will be required to review these documents and other responsive information specifically identified or prescreened by EPA staff. The Contractor will be required to provide evaluation reports to EPA approximately within 21 days of receiving documents from EPA, unless otherwise directed by EPA.

During and following a review of Navy documents, the Contractor may be requested to identify additional information necessary to properly assess the current structural integrity of the tanks and the feasible application of secondary containment or advanced liner technologies at the Facility. After completing a thorough evaluation of the existing reports, including those the Contractor has requested, the Contractor shall provide an overall assessment of each tank's structural integrity and previous secondary containment and liner investigations.

Documents are still forthcoming from the Navy, and EPA is assessing the breadth and depth of submissions.

3. Technical Consultation

EPA and the Navy regularly hold conference calls to discuss the Navy's regulatory requirements in response to the January 2014 release, any outstanding issues at the Facility, and ongoing negotiations involving EPA and the Navy. The Contractor will be required to attend a limited number of critical technical conference calls about secondary containment and large vessel liners and their application to the Facility. The Contractor shall be able to quickly articulate issues related to secondary containment and large vessel liner technologies, as well as provide technical expertise for EPA during discussions with the Navy.

We expect that the Contractor will need to attend roughly 10 conference calls.

4. Best Available Secondary Containment Review and Recommendation

As part of its ongoing discussions with the Navy, EPA is evaluating the potential for tank

improvements that would prevent future releases. EPA staff must become familiar with the best available retrofitting technology currently in industry, as well as practicable applications that could be implemented at the Facility, given the unique and complex technical challenges. The Contractor will serve as EPA's technical expert, surveying the best available technologies in the industry and determining what is feasible at the site. The Contractor's evaluation should include various technologies, such as secondary containment, tank liners, tank within tank proposals, etc.

The Contractor shall submit a technical report to EPA that includes a best available tank retrofit technology analysis. The analysis should contain some combination of the following elements: 1) a list of current technologies at large field-constructed tanks with a detailed description; 2) a determination as to whether a listed technology is feasible with justification; 3) an analysis of the leak prevention capabilities of all feasible technologies; 4) a cost estimate, including capital and maintenance costs, of all feasible technologies; and 5) an estimate to construct each feasible technology on one tank at the Facility and at all field-constructed tanks at the Facility.

This Analysis will require a breadth of industry knowledge regarding large petroleum tank systems. The Contractor shall be familiar with industry best practices involving large vessel structures and leak prevention, and be able to amply justify cost estimates, measurement reliability and estimated installation schedules.

5. Travel and Facility Evaluation

During ongoing negotiations and in the development of the tasks above, the Contractor may need to travel to the Facility site in Pearl Harbor, HI. The Contractor will make no more than two trips to Honolulu, HI for a period of three days per trip. A trip would consist of a Facility tour, discussion with operations personnel, and attendance at meetings with EPA and Navy personnel.

V. Milestones and Deliverables

Task	Deliverable	Due
1.	Scoping Meeting	Within 10 days of receiving SOW
	Project Plan	Within 10 days of the scoping meeting
	Monthly Status Calls	TBD
2.	Ongoing Document Review Summaries	TBD
	Ongoing Workplan Review Summaries	TBD
3.	Ongoing Consultation Emails	TBD
	Conference Calls	TBD
4.	Best Available Tank Retrofit Technology Analysis	Q3/Q4 FY 2015
5.	Onsite Facility Tour	Q2 FY 2015
	Onsite Negotiations	Q2 FY 2015